

particular access attempt is completed early when a NACK, FAIL, or no response is received (i.e. ACK is not received or inferred) after the first frame.

Intermediate station resources (i.e., a receive buffer) must be available for a station to receive any frame that may be intended for it. In the case of an intermediate station acting as a relay, no additional receive buffer is required since the receive buffer is immediately emptied (frame retransmitted) and made available before any other traffic can arrive at the station (since the medium will be busy for the duration of the frame to and from the intermediate station). If the frame to be relayed cannot be retransmitted immediately, it will be dropped. A frame may not be able to be transmitted immediately (and is therefore dropped) if the forwarding frame is interrupted by a higher priority, or if the frame is too long to fit in a single segment because of the frame length and current channel map. In the latter case, the station returns a FAIL to the originating station. The reserved bits in FAIL could be used for a REASON field to return a fail reason code (i.e. indicate frame too long to forward) if there is more than one reason to return a FAIL.

Other Embodiments

It is to be understood that while the invention has been described in conjunction with the detailed description thereof, the foregoing description is intended to illustrate and not limit the scope of the invention, which is defined by the scope of the appended claims. Other embodiments are within the scope of the following claims.

What is claimed is:

1 1. A method of frame forwarding for use in a network of stations connected to a
2 shared medium comprising:

3 preparing by a first station as a first frame a frame intended for a second station to be sent
4 to an intermediate station for forwarding to the second station as a second frame, the frame
5 including a delimiter and the delimiter including control information to be heard by other stations
6 in the network for controlling the timing of the frame forwarding; and

7 causing the frame to be transmitted as the first frame to the intermediate station and the
8 intermediate station to modify the frame by changing the control information prior to
9 transmitting the modified frame as the second frame to the second station.

1 2. The method of claim 1, wherein the first frame includes as a destination address
2 an address of the second station and an intermediate address field specifying an address for the
3 intermediate station.

1 3. The method of claim 2, wherein the first frame further includes a forwarding
2 indication that the frame is to be forwarded to the destination address by the intermediate
3 address.

1 4. The method of claim 3, wherein the first frame further includes an indication that
2 a response is expected from the intermediate station.

1 5. The method of claim 4, further comprising:
2 receiving the expected response from the intermediate station.

1 6. The method of claim 4, wherein the second frame includes an indication that a
2 response is expected from the second station.

1 7. The method of claim 6, wherein the second frame includes an indication that two
2 responses are to follow the second frame, a first one of the two responses to be sent by the
3 second station in response to the second frame and a second one of the two responses to be sent
4 by the intermediate station in response to the first one of the responses.

1 8. The method of claim 2, wherein the first frame includes a delimiter and the
2 delimiter includes a priority and a contention-control indicator for indicating to the intermediate
3 station that the second frame can occur in a next contention period unless any other frames
4 having priorities higher than the priority may be awaiting transmission, in which instance the
5 second frame is to be discarded.

1 9. The method of claim 2, wherein the first frame includes a delimiter and the
2 delimiter includes a highest priority and a contention-control indicator for indicating contention-
3 free access so that no other stations can interrupt the frame forwarding prior to the transmission
4 of the second frame by the intermediate station.

1 10. The method of claim 9, wherein an actual priority of the frame being forwarded is
2 included in a segment control field in the payload of the first frame.

1 11. The method of claim 10, wherein the frame lengths of the first and second frames
2 are limited to reduce latency of the frame forwarding when the priority of the delimiter is the
3 highest and the actual priority in the segment control field in the payload of the first frame is not
4 the highest.

1 12. The method of claim 2, wherein the first and second frames have the same fields,
2 and wherein the second frame is a modified version of first frame.

1 13. The method of claim 12, wherein each of the first and second frames includes a
 2 start delimiter followed by a payload,
 3 the start delimiter including a contention control field, the contention control field in the
 4 first frame having a value for indicating contention-free status for a next contention period
 5 following the first frame, the payload having a priority field that is set to a priority associated
 6 with the frame to be forwarded and the payload further including the forwarding indication as a
 7 two-bit value, the two-bit value in the first frame having a first bit set to indicate that frame
 8 forwarding is to occur and a second bit corresponding to a contention control value of the frame
 9 to be forwarded when the first bit is set.

1 14. The method of claim 13, wherein the first and second frames further includes an
 2 end delimiter having a contention control field and a priority field, the contention control field in
 3 the end delimiter in the first frame including a copy of the contention control value of the start
 4 delimiter in the first frame and the priority field in the end delimiter of the first frame including a
 5 priority associated with the first frame.

1 15. The method of claim 12, wherein the contention control field in the start delimiter
 2 of the second frame includes a copy of the contention control value specified by the forwarding
 3 indication in the first frame, and wherein the forwarding indication in the second frame includes
 4 a cleared first bit and a set second bit to indicate that a frame is being forwarded to a final
 5 destination and the priority field in the payload of the second frame includes a copy of the
 6 priority in the priority field of the payload of the first frame.

1 16. The method of claim 14, wherein the end delimiter further includes a response
 2 with response expected field for indicating whether two responses are to follow.

1 17. The method of claim 15, wherein the start and end delimiters each include a
 2 delimiter type field for indicating whether or not a response is expected.

1 18. The method of claim 17, further comprising:
2 receiving a response from the intermediate station if the delimiter type field in the first
3 frame so indicates.

1 19. The method of claim 18, wherein the response includes a priority field having a
2 priority that is the same as that of the priority field in the end delimiter in the first frame and a
3 contention control field having a contention control value that is the same as that of the
4 contention control field in the
5 start delimiter in the first frame.

1 20. The method of claim 17, further comprising:
2 receiving a response from the second station, the response from the second station
3 including a priority field having a priority that is the same as that of the priority field in the
4 payload of the first frame and a contention control field having a contention control value that is
5 the same as that of the contention control field in the forwarding indication in the payload of the
6 first frame.

1 21. The method of claim 17, further comprising:
2 receiving a second response from the intermediate station, the second response from the
3 intermediate station including a priority field having a priority that is the same as that of the
4 priority field in the payload of the first frame and a contention control field having a contention
5 control value that is the same as that of the contention control field in the forwarding indication
6 in the payload of the first frame.

1 22. The method of claim 13, wherein the start delimiter further includes a response
2 with response expected field to indicate whether or not two responses are expected to follow and
3 a field for indicating the presence of an end delimiter following the payload.

23. The method of claim 14, wherein the start delimiter in the first frame further includes a length field for indicating the length of the first frame and the end delimiter in the first frame further includes a second length field for indicating the length of the second frame to follow.

24. The method of claim 22, wherein the start delimiter includes a priority field, the priority field in the start delimiter of the first frame including a priority associated with the first frame and the response including a priority field having a priority that is the same as that of the priority field in the start delimiter in the first frame and a contention control field having a contention control value that is the same as that of the contention control field in the start delimiter in the first frame.

25. The method of claim 2, wherein the second frame is transmitted immediately or discarded.

26. The method of claim 14, wherein the start and end delimiters are intended to be observed by all of the stations in the network.

27. The method of claim 1, further comprising:
selecting the intermediate station for frame forwarding from among the stations that can communicate with the second station using connection information based on characteristics of a respective first channel connection between each station and the second station and a second channel connection between each station and the first station.

28. The method of claim 27, wherein selecting further comprises:
requesting the connection information for the first channel connection from the stations.

1 29. The method of claim 27, wherein selecting comprises:
2 selecting a station as the intermediate station based on combined characteristics of the
3 first and second connections for a station as the intermediate station that give a highest data rate.

1 30. The method of claim 27, wherein selecting comprises:
2 selecting a station as the intermediate station based on combined characteristics of the
3 first and second connections for a station as the intermediate station that give a most reliable
4 transmission.

1 31. The method of claim 27, wherein selecting comprises:
2 receiving from the intermediate station for the first channel connection between the
3 second station and the intermediate station a channel map specifying a maximum frame capacity.

1 32. The method of claim 27, further comprising:
2 selecting a maximum frame size based on the smaller of the maximum frame capacity for
3 the second channel connection to the intermediate station and the maximum frame capacity
4 specified by the channel map for the first channel connection between the second station and the
5 intermediate station.

1 33. The method of claim 1, further comprising:
2 determining that data throughput over the shared medium can be increased by having the
3 frame forwarded to the second station by the intermediate station instead of being transmitted to
4 the second station by the first station directly.

1 34. The method of claim 1, further comprising:
2 determining that the first station is unable to communicate with the second station.

1 35. In a network having stations connected to a shared

1 medium, a medium access control unit at the stations for controlling transmission of
2 frames on the medium, the media access control unit comprising:

3 a frame processing unit to prepare by a first station as a first frame a frame intended
4 for a second station to be sent to an intermediate station for forwarding to the second station
5 as a second frame, the frame including a delimiter and the delimiter including control
6 information to be heard by other stations in the network for controlling the timing of the
7 frame forwarding; and

8 a frame transmit unit to cause the frame to be transmitted as the first frame to the
9 intermediate station and the intermediate station to modify the frame by changing the control
10 information prior to transmitting the modified frame as the second frame to the second
11 station.

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